

Resolution of the *Thelymitra fuscolutea* R. Br. (Orchidaceae) complex of southern Australia.

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Abstract

The seven currently known taxa in the *Thelymitra fuscolutea* R.Br. complex from southern Australia are discussed and descriptions are presented for each. *Thelymitra jacksonii* Hopper & A.P.Br. ex Jeanes, *Thelymitra magnifica* Jeanes and *Thelymitra yorkensis* Jeanes from southwestern Western Australia are described as new and illustrated. The key diagnostic features relating to the size and colour of the perianth and the shape of the supra-anther lobe of the column are elucidated. Information on distribution, habitat, pollination biology, flowering time and conservation status is given for all seven taxa. The main distinguishing features of *Thelymitra benthamiana* Rehb.f., *Thelymitra dedmaniarum* R.S.Rogers, *T. fuscolutea* and *Thelymitra stellata* Lindl. and the three new species are tabulated. A key is provided to distinguish all seven members of the *T. fuscolutea* complex.

Introduction

Thelymitra J.R.Forst. & G.Forst. is a complex genus of orchids consisting of about 90 described species, several described natural hybrids and at least 20 undescribed taxa. It is concentrated in higher rainfall areas of temperate Australia, but a few species occur in tropical northeastern Australia, about 20 species occur in New Zealand (15 endemic) and a few species occur in Indonesia, New Caledonia, New Guinea and the Philippines.

A number of morphological features exist that, in combination, distinguish members of the *Thelymitra fuscolutea* R.Br. complex from other *Thelymitra* species. The column has a well developed wing with a fimbriate distal margin and a pair of digitate lateral lobes (each with a pair of similar but thinner and often longer basal lobes) inserted on the column wing between the fimbriae and the post-anther lobe. The post-anther lobe (sometimes called the mid-lobe) is continuous with the column wing, more or less rectangular and is covered on the dorsal surface by short, bristly trichomes, varying in density between species. Decurrent on the dorsal surface of the column is a fleshy, rod-like, often clavate supra-anther lobe, situated mostly above the post-anther lobe. The anther has an elongate terminal beak that is essentially an extension of the connective (see Fig. 1). The leaves are glabrous, generally entirely pale green, ovate to ovate-lanceolate and held close to the ground or sub-erect (only *Thelymitra crinita* from Western Australia has similarly shaped leaves, but these can be distinguished readily by the maroon stripes and suffusions near the base). The perianth is generally bicoloured, usually spotted, blotched or striated in various shades of yellow and brown.

Taxonomic history

The first species in the group recognised, *T. fuscolutea*, was described by Brown (1810), the distribution given as (M.) for southern Australia between Cape Leeuwin and

Wilson's Promontory. The lectotype (*vide* Clements 1989) is from King George Sound (Albany district) Western Australia. Lindley (1839–1840) described *Thelymitra stellata* Lindl., the distribution given as Western Australia (Lindley 1840). Reichenbach (1871) described *Thelymitra benthamiana* Rchb.f., the distribution given as Swan River. In *Flora Australiensis*, Bentham (1873) recognised only *T. fuscolutea* and *T. stellata*, while reducing *T. benthamiana* to synonymy under the former. Rogers (1938) described *Thelymitra dedmaniarum* R.S.Rogers (as *Thelymitra Dedmanae*) from Toodyay near Perth in southwestern Western Australia. There had long been confusion about the delimitations of the above four taxa, and George (1971) created the new combinations *T. fuscolutea* R.Br. var. *fuscolutea* (with *T. benthamiana* reduced to synonymy therein) and *T. fuscolutea* R.Br. var. *stellata* (Lindl.) A.S.George (with *T. stellata* reduced to varietal rank and *T. dedmaniarum* [as *T. dedmanae*] reduced to synonymy therein). This classification was taken up by Hoffman and Brown (1984). Following his study of Australian Orchidaceae types, Clements (1989) again recognised *T. benthamiana*, *T. fuscolutea* and *T. stellata* as distinct species while relegating *T. dedmaniarum* (as *T. dedmaniae*) to synonymy under *T. stellata*. Hoffman and Brown (1992) followed Clements in recognising *T. benthamiana*, *T. fuscolutea* and *T. stellata* as distinct species, but also reinstated *T. dedmaniarum* (as *T. dedmaniae*) as a species following its recent rediscovery. Hoffman and Brown (1992) also informally described *Thelymitra jacksonii* ms (formally described below as *T. jacksonii* Hopper & A.P.Br. ex Jeanes), a newly discovered species from the Walpole area west of Albany. Hoffman and Brown (1998) again recognised *T. benthamiana*, *T. fuscolutea*, *T. stellata*, *T. dedmaniarum* (this time with the name incorrectly applied to specimens found in 1996 during surveys southwest of York, described below as *Thelymitra yorkensis* Jeanes) and *T. jacksonii* ms, while recognising *Thelymitra* aff. *dedmaniarum* (the true *T. dedmaniarum*, and later to become incorrectly known informally as *Thelymitra manginii* ms and subsequently *Thelymitra manginiorum* ms). In addition, Hoffman & Brown (1998) recognised a further taxon designated as *Thelymitra* aff. *stellata* (described below as *Thelymitra magnifica* Jeanes). This brought the total number of species in the group to seven, three of which remained undescribed. For a summary of the taxonomic history see Table 1.

Discussion

Historically there has been great confusion about the correct application of names and the interpretation of species within the *T. fuscolutea* complex. At least some of this confusion has persisted to the present day and has revealed itself in the many floras and orchid books published over the years.

The type material of Brown's *T. fuscolutea* was collected by Bauer at King George Sound (Albany district) Western Australia in January 1802 and is currently housed at the British Museum, London along with two excellent drawings executed by Bauer in December 1801. The type material and the Bauer drawings fix the name of *T. fuscolutea* unequivocally, the most salient feature being the digitiform supra-anther lobe on the column. Although the apex of the supra-anther lobe is depicted as bilobed in Bauer's front view of the column, there is no evidence that it is clavate to any significant degree. In 1839 Drummond collected the type material of Lindley's *T. stellata*, probably somewhere between Perth and his property at Toodyay some 80 km to the northeast. The illustration of the column on the holotype sheet (probably executed by Lindley) shows the supra-anther lobe to have a markedly clavate and warty apex, thus clearly distinguishing *T. stellata* from *T. fuscolutea*. Reichenbach (1871) described *T. benthamiana*, also from material collected by Drummond (in 1838), and carefully

compared his new species to *T. fuscolutea* and *T. stellata*, particularly in terms of the differences in the supra-anther lobe (termed the ‘dorso androclinii’ by Reichenbach). Bentham (1873) argued that *T. benthamiana* was synonymous with *T. fuscolutea* based largely on his interpretation of Bauer’s drawings and a specimen collected by Captain King that appears to conform to *T. benthamiana* but was labelled by Brown as *T. fuscolutea*. Bentham’s interpretation of Bauer’s drawings is difficult to follow and, I believe, unconvincing. Since both *T. fuscolutea* and *T. benthamiana* occur in the Albany district (and the latter is generally the more common) it would not be surprising if the King collection were the latter species; nor would it be surprising if Brown wrongly interpreted it as his own *T. fuscolutea* given his limited exposure to the group during his brief visit. Reichenbach (1874) quickly repudiated Bentham’s arguments and published a drawing of *T. fuscolutea* and *T. benthamiana* side by side, which shows clearly the different structure of the supra-anther lobe of the two species.

Nearly all the authors of significant floras and orchid accounts since Bentham (1873) and prior to Jones (1988) unfortunately adopted Bentham’s taxonomy over Reichenbach’s (e.g. Mueller 1882, Rogers 1911, Black 1922, Ewart 1931, Erickson 1951, Blackall 1954, Willis 1962, Gray 1966, Nicholls 1969 & Fiveash & Lothian 1974). George (1971) further simplified matters by reducing *T. stellata* to varietal status under *T. fuscolutea* and Hoffman & Brown (1984) followed this approach. Following his study of orchid type material, illustrations and the literature, Clements (1989) came to the conclusion that *T. benthamiana*, *T. fuscolutea* and *T. stellata* were distinct entities worthy of recognition at species rank. This view is supported by the results of contemporary research and field studies, including my own work, and most recent authors have followed Clements’ taxonomy (e.g. Bates & Weber 1990, Hoffman & Brown 1992, Weber & Entwisle 1994, Backhouse & Jeanes 1995, Hoffman & Brown 1998, Jeanes & Backhouse 2004).

Rogers (1938) described *T. dedmaniarum* from specimens collected in 1934 by Mrs and Miss Dedman at Toodyay, Western Australia. The specific epithet given by Rogers was *Dedmanae*, but this was corrected recently to *dedmaniarum* to conform to Article 60.11 of the International Code of Botanical Nomenclature. The termination must be in the feminine plural, because the epithet commemorates Mrs and Miss Dedman, hence ‘-iarum’. The new species was described by Rogers as being ‘rather robust’ and to have ‘unspotted perianth-segments’, two features clearly seen in the type specimens housed at AD. Rogers compared *T. dedmaniarum* with *T. fuscolutea*, but the strongly elevated supra-anther lobe and large flowers would suggest that it has closer affinities with *T. stellata*. Erickson (1951) and Blackall (1954) accepted *T. dedmaniarum* as a distinct species, but George (1971) reduced it to synonymy under his *T. fuscolutea* var. *stellata*. His argument was that it ‘only differs from the var. *fuscolutea* (sic) [presumably a typographical error that should read var. *stellata*] in having the perianth more uniformly golden-brown and the column fringe a bright orange’. Since *T. dedmaniarum* was known only from the type specimens, and had not been seen for nearly 40 years, George’s opinion about it being a mere colour form was generally followed (e.g. Hoffman & Brown 1984 & Clements 1989). In 1985 *T. dedmaniarum* was rediscovered near Gidgegannup, about 35 km northeast of Perth, and the consistency of these plants and their similarity to the type and Rogers’ original description were convincing evidence that it was a valid species worthy of recognition (see Hoffman & Brown 1992, page 243). The identity of *T. dedmaniarum* became confused when Hoffman & Brown (1998) incorrectly linked the name to plants found in 1995 in the vicinity of York (about 90 km east of Perth). These plants in fact represented an undescribed species, described

Table 1. Taxonomic history of the *T. fuscolutea* complex and the names used by various authors

Author	Name used	Name used	Name used	Name used	Name used	Name used	Name used
Brown (1810)	<i>T. fusco-lutea</i>	n/a	n/a	n/a	n/a	n/a	n/a
Lindley (1839–1840)	<i>T. fusco-lutea</i>	<i>T. stellata</i>	n/a	n/a	n/a	n/a	n/a
Lindley (1840)	<i>T. fusco-lutea</i>	<i>T. stellata</i>	n/a	n/a	n/a	n/a	n/a
Reichenbach (1871)	<i>T. fusco-lutea</i>	<i>T. stellata</i>	<i>T. Benthamiana</i>	n/a	n/a	n/a	n/a
Bentham (1873)	<i>T. fusco-lutea</i>	<i>T. stellata</i>	<i>T. fusco-lutea</i>	n/a	n/a	n/a	n/a
Reichenbach (1874)	<i>T. fuscolutea</i>	<i>T. stellata</i>	<i>T. Benthamiana</i>	n/a	n/a	n/a	n/a
Mueller (1882)	<i>T. fusca-lutea</i>	<i>T. stellata</i>	none	n/a	n/a	n/a	n/a
Rogers (1938)	<i>T. fuscolutea</i>	none	none	<i>T. Dednanae</i>	n/a	n/a	n/a
Erickson (1951)	<i>T. fuscolutea</i>	<i>T. stellata</i>	none	<i>T. Dednanae</i>	n/a	n/a	n/a
Blackall (1954)	<i>T. fusco-lutea</i>	<i>T. stellata</i>	none	<i>T. Dednanae</i>	n/a	n/a	n/a
Nicholls (1969)	<i>T. fusco-lutea</i>	none	none	none	n/a	n/a	n/a
George (1971)	<i>T. fuscolutea</i> var. <i>fuscolutea</i>	<i>T. fuscolutea</i> var. <i>stellata</i>	<i>T. fuscolutea</i> var. <i>fuscolutea</i>	<i>T. fuscolutea</i> var. <i>stellata</i>	n/a	n/a	n/a
Fiveash & Lothian (1974)	<i>T. fusco-lutea</i>	none	none	none	n/a	n/a	n/a
Hoffman & Brown (1984)	<i>T. fuscolutea</i> var. <i>fuscolutea</i>	<i>T. fuscolutea</i> var. <i>stellata</i>	none	none	n/a	n/a	n/a
Jones (1988)	<i>T. fuscolutea</i>	<i>T. stellata</i>	<i>T. benthamiana</i>	none	n/a	n/a	n/a
Clements (1989)	<i>T. fuscolutea</i>	<i>T. stellata</i>	<i>T. benthamiana</i>	<i>T. stellata</i>	n/a	n/a	n/a
Hoffman & Brown (1992)	<i>T. fuscolutea</i>	<i>T. stellata</i>	<i>T. benthamiana</i>	<i>T. dednanae</i>	<i>T. jacksonii</i>	n/a	n/a
Hoffman & Brown (1998)	<i>T. fuscolutea</i>	<i>T. stellata</i>	<i>T. benthamiana</i>	<i>T. aff. dednaniarum</i>	<i>T. jacksonii</i>	<i>T. aff. stellata</i>	<i>T. dednaniarum</i>
Jeanes (this paper)	<i>T. fuscolutea</i>	<i>T. stellata</i>	<i>T. benthamiana</i>	<i>T. dednaniarum</i>	<i>T. jacksonii</i>	<i>T. magnifica</i>	<i>T. yorkensis</i>

Table 2. Various features of species in the *T. fuscolutea* complex.

Feature	<i>T. fuscolutea</i>	<i>T. benthamiana</i>	<i>T. jacksonii</i>	<i>T. magnifica</i>	<i>T. ledmianarum</i>	<i>T. yorkensis</i>	<i>T. stellata</i>
Sepal length	8-20 mm	10-20 mm	16-27 mm	16-28 mm	12-28 mm	13-26 mm	12-22 mm
Perianth colour	Mostly brown or purplish with few yellow or greenish spots or striations	Yellow or greenish with reddish brown spots and blotches	Dark golden-brown with large yellow blotches and striations	Dark golden-brown with large yellow blotches and striations	Mostly golden yellow, often reddish brown towards the base	Orange with reddish brown edges	Brown to reddish brown with large yellow blotches and striations
Column apex colour	White or cream	Yellow or orange	Yellow or orange	Yellow or orange	Yellow or orange	Yellow or orange	Yellow or orange
Supra-anther lobe shape	Digitiform	Slightly clavate	Markedly clavate	Markedly clavate	Markedly clavate	Markedly clavate	Markedly clavate
Supra-anther lobe apex	Smooth, undifferentiated	Rugose	Rugose to warty, bilobed, ridged	Rugose to warty, ridged	Rugose, bilobed	Rugose to warty	Rugose to warty, bilobed, ridged
Anther beak size	2-3 x c. 1 mm	2.5-3.5 x c. 0.8 mm	3-4 x c. 1.5 mm	2.5-3 x c. 1.4 mm	2.5-3.5 x c. 2 mm	2.5-3 x c. 1.5 mm	2-3 x c. 1.2 mm
Floral scent	None noted	None noted	Sweet	Cinnamon-like	Cinnamon-like	Cinnamon-like	Sweet
Flowering time	Nov. -Feb.	Sept. -Nov.	Dec. & Jan.	Sept. & Oct.	Oct. & Nov.	Oct. -Dec.	Oct. & Nov.
Preferred substrates	Moist sandy loams	Dry or seasonally moist sandy loams	Moist sandy clay soils	Seasonally moist granitic soils	Dry granitic soils	Dry granitic soils	Dry lateritic soils

in this paper as *T. yorkensis*. As a critically endangered species *T. dedmaniarum* has been subject to a draft recovery plan (Phillimore et al. 1999), but unfortunately this has been done under the superfluous name *T. manginii* ms (later amended to the equally superfluous *T. manginiorum* ms).

Recent fieldwork in Western Australia has revealed three rare cryptic undescribed species with close affinities to *T. stellata* (see Hoffman & Brown 1992 & Hoffman & Brown 1998). My own research has confirmed the presence of these species and the main purpose of this paper is to describe them and to clarify how they differ from other members of the *T. fuscolutea* complex, and in particular from *T. stellata*. They are so similar morphologically to *T. stellata* that it creates the problem of fixing that name correctly to a particular species, as known today. Pressed material of members of the genus *Thelymitra* can be very difficult to identify positively as many diagnostic features are lost or become difficult to interpret upon drying and pressing. This is certainly true of the type specimens of *T. stellata*, and this situation is not helped by the complete absence of accurate location information or any biological or ecological data on the type sheets. All we have is pressed material and a rough sketch of the column on the holotype, but these could equally fit any of the four species in the group (as well as *T. dedmaniarum*). Traditionally the name *T. stellata* has been linked to the most widespread member of the group, found on lateritic soils mainly between Three Springs and Pinjarra, but which is also known to have occurred at least in the vicinity of the type locality (see Hoffman & Brown 1992, page 244). With the lack of any compelling evidence to the contrary it would appear prudent to continue to link the name *T. stellata* with this species. For a comparison between the various characteristics of *T. stellata* and the three new species, *T. jacksonii*, *T. magnifica* and *T. yorkensis*, see Table 2 and the individual species accounts.

Sub-generic classifications

Surprisingly, the *T. fuscolutea* complex has never had any formal recognition at the subgeneric level in spite of the many distinctive and unique characters of the group. Brown (1810) recognised two informal groups within *Thelymitra*, group one with blue, white or pink flowers and group two with yellow flowers. Brown placed *fuscolutea*, along with *helymitra tigrina* R.Br., into his group two. Bentham (1873) included *T. fuscolutea* and *T. stellata* (the only two species within the *T. fuscolutea* complex then recognised) within his section *Cucullaria*, along with a diverse assemblage of species sharing in common a hooded post-anther lobe over the anther.

Although there are several obvious groups within *Thelymitra* that would lend the genus to a subgeneric classification, such a classification would be premature without a comprehensive molecular phylogenetic study of the genus as a whole. Such a study would also help to place the several apparently anomalous species within a subgeneric framework.

Explanation of the terminology used

The genus *Thelymitra* is unusual in the Orchidaceae in that the six perianth segments generally differ very little from each other in terms of size, shape and ornamentation. The labellum does not bear any hairs, calli, glands, ridges, lobes, teeth or fringes and is apparently not involved in pollination. Since the perianth is virtually actinomorphic and generally lacks characters by which to distinguish the species, traditionally the structure of the column has supplied most of these distinguishing characters. Over the years a

terminology has evolved to describe the column structure in *Thelymitra*, but some of these terms are poorly understood and some have never been defined adequately. Below is an explanation of some of the terms commonly used in this paper; most have a traditional usage, although this has often not been well understood, while one is used for the first time.

Column (gynostemium): The column is exposed in the centre of the flower, it lacks a free filament and style, is short and thick and broadly winged from below the stigma to the level of the anther or beyond. The apex is usually 3–5-lobed and is often ornamented with trichomes, fringes, teeth, calli, glands, tubercles or lobes. In members of the *T. fuscolutea* complex the apex of the column is very distinctive including fimbriae on the distal margins of the column wings, a pair of digitate lateral lobes, each with a pair of thinner, often longer, digitate basal lobes, a post-anther lobe that is continuous with the column wing and has the dorsal surface covered with short, stiff trichomes, and a rod-like, often clavate supra-anther lobe.

Post-anther lobe (mid-lobe): This structure lies beyond the point of insertion of the anther and of the lateral lobes, and it is usually of a different colour to the rest of the column. It has a complex vascular supply always associated with that of the functional anther and may be regarded as an outgrowth of the filament. In some species it is represented only by a short flap or a band of small calli crowded across the back of the anther. In most species it extends well beyond the anther with a free margin that may be plain, undulate, toothed, notched or variously ornamented with tubercles. At its maximum development it forms a fleshy, tubular hood that is variously open on the ventral side and overhangs and obscures the anther. In the *T. fuscolutea* complex the post-anther lobe is continuous with the column wing, fleshy, and covered by short, stiff trichomes on its dorsal surface.

Lateral lobes (column-arms or lateral staminodes): These two structures lie one on each side of the post-anther lobe and extend forward or upward and often converge. They are each supplied by a single unbranched vascular bundle and are thought to represent staminodes. They may be flat and ribbon-like, terete and finger-like, straight, curved, twisted spirally or bent sharply, and are usually ornamented with lobes, teeth, tubercles or trichomes. The lateral lobes are finger-like in members of the *T. fuscolutea* complex, are more or less straight and parallel and point in the same general direction as the body of the column. At the base of each lateral lobe there is a pair of longer, thinner, finger-like lobes.

Auxiliary lobes (accessory lobes or side lobules): Several species of *Thelymitra* have a pair of distinct lobes between the post-anther lobe and the lateral lobes. These have no vascular strand and are most accurately described as being part of a tripartite post-anther lobe. They tend to be fleshy with irregularly jagged margins and sometimes have small surface tubercles. In the *T. fuscolutea* complex the auxiliary lobes are completely absent.

Supra-anther lobe: This is a fleshy, rod-like, often clavate organ that is decurrent on the dorsal surface of the column and is situated mostly above the anther and the post-anther lobe. It does not have its own vascular supply and is best thought of as an appendage of the column. This organ is peculiar to the *T. fuscolutea* complex and in the literature has generally been misinterpreted as the post-anther lobe.

Anther: In *Thelymitra*, the anther is usually small, ovoid, and situated entirely between the column wings. The connective extends beyond the pollinia into an apical beak-like projection of varying size. The anther may be entirely above the stigma or

variously obscured behind it. In the *T. fuscolutea* complex the anther is usually inserted in the lower third of the column, the pollinia partially obscured behind the stigma. The anther beak is very well developed, usually being about as long as the pollinia, is fleshy and shallowly s-shaped in profile.

Pollinia: Members of the genus *Thelymitra* contain four pollinia in two groups of two. In the *T. fuscolutea* complex the pollinia are usually tightly bound with the pollinarium being removed by insects as a single unit. However, autogamy has been noted in *T. benthamiana*.

Stigma: The stigma in *Thelymitra* is more or less bi-lobed at the apex, usually quadrate or transverse-elliptic in shape and located at the base of the column on a thick stalk.

Materials and methods

This paper is the result of a qualitative and quantitative study of the pertinent type material (or photographic reproductions thereof), hundreds of herbarium specimens (both dry and spirit-preserved) from AD, BM, BRI, CANB, E, HO, MEL, NSW, P, PERTH, QRS, SUNIV and WELT, and numerous freshly collected specimens, all of which were vouchered and deposited at the relevant herbaria. Orchid taxa in general, and *Thelymitra* taxa in particular, are much more readily identified from fresh living material where characters of the perianth, the column, flower colour and fragrance are still intact. Familiarity with the taxa gained from field study and the study of freshly collected specimens sent to me by field operatives has made the identification of dried and spirit-preserved herbarium material (including type specimens) much easier.

When collecting *Thelymitra* for study it is essential that the entire above ground parts of the plant be taken, with the majority of the material being preserved in spirit. Plants preserved in the pressed state are often difficult to identify to species level in the absence of additional information. Spirit preserved specimens on the other hand, are generally much more easily identified to species level. The observation of plants growing *in-situ* is the ideal method of study for *Thelymitra* in general, and often it is only by this method that cryptic new species can be identified. For this reason the importance of field work in the study of species complexes within *Thelymitra* cannot be overstated and should form an integral part of any future studies of the group. It is possible that other taxa worthy of recognition exist within this complex, but adequate information and collections of these are lacking at present.

Taxonomy

Key to the known members of the *T. fuscolutea* complex.

1. Perianth segments mostly <20 mm long; supra-anther lobe of column of more or less uniform cross-section throughout or only slightly clavate at the apex 2
1. Perianth segments usually >20 mm long on at least some flowers; supra-anther lobe of column markedly clavate at the apex 3
2. Supra-anther lobe of column digitiform, of more or less uniform cross-section throughout; column apex white or cream; inner surface of perianth predominantly dark reddish brown with narrow greenish yellow margins and a few greenish yellow

- spots and suffusions; flowers November to January; swampy habitats of southwestern Western Australia 1. *T. fuscolutea*
2. Supra-anther lobe of column slightly clavate at the apex; column apex yellowish; inner surface of perianth greenish yellow with dark reddish brown spots and suffusions; flowers September to November; drier habitats of southwestern and southeastern Australia 2. *T. benthamiana*
3. Inner surface of tepals more or less concolorous, of a golden yellow colour, often slightly brownish towards the base; flowers strongly cinnamon-scented..... 5. *T. dedmaniarum*
3. Inner surface of tepals usually strongly bicolorous, mostly brown with golden yellow streaks and blotches; flowers sweet-scented or cinnamon-scented..... 4
4. Supra-anther lobe of column with a prominently clavate, warty apex >1.5 mm thick..... 5
4. Supra-anther lobe of column with a clavate, rugose to warty apex <1.5 mm thick.... 6
5. Supra-anther lobe of column prominently bilobed at apex; plants growing in sandy soils near winter-wet depressions; flowers sweet-scented, appearing December and January; Walpole area 3. *T. jacksonii*
5. Supra-anther lobe of column not prominently bilobed at apex; plants growing in seasonally moist granitic soils on edges of escarpments; flowers cinnamon-scented, appearing September and October; Darling Ranges..... 4. *T. magnifica*
6. Flowers in a moderately open inflorescence, strongly cinnamon scented; supra-anther lobe not prominently bilobed; plants primarily of Wandoo (*Eucalyptus wandoo* and *Eucalyptus accedens*) forests 6. *T. yorkensis*
6. Flowers rather crowded and overlapping, sweet-scented; supra-anther lobe prominently bilobed; plants primarily of Jarrah (*Eucalyptus marginata*) forests 7. *T. stellata*

1. *Thelymitra fuscolutea* R.Br., *Prodr.* 315 (1810).

Type: King George's Sound, 2.i.1802, *F. Bauer s.n.* (lectotype element α BM!, *vide* Clements 1989; isolectotype BM!; iconotype BM!).

Illustrations: Bauer 171A and Bauer 171B (Dec. 1801) both original illustrations at the British Museum; Reichenbach (1874) plate 1991, figs 1–5; Jones (1988) page 295; Hoffman & Brown (1992) page 241; Hoffman & Brown (1998) page 241.

Glabrous terrestrial *herb*. *Tubers* ovoid or obovoid, 1–3 cm long, 5–12 mm wide, fleshy. *Leaf* ovate-lanceolate to ovate, 5–15 cm long, 5–20 mm wide, erect or obliquely erect, blade more or less flat, leathery, bright green to yellowish green, sheathing at base, apex acute to acuminate, sometimes shortly apiculate. *Scape* 15–45 cm tall, 1.3–3.5 mm diam., more or less straight, green. *Sterile bracts* usually 2, occasionally 3, lanceolate to ovate-lanceolate, 2–7 cm long, 3–10 mm wide, closely sheathing, usually green, apex often free and diverging from scape, acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 7–32 mm long, 2–6 mm wide, sheathing the pedicels,

green or purplish. *Pedicels* 5–15 mm long, slender. *Ovary* narrow-obovoid, 5–15 mm long, 1.5–4 mm wide, often curved. *Flowers* 2–15(–25), 20–40 mm across, thick-textured, mostly brown or purplish with yellow or greenish spots or stripes, opening freely in warm weather. *Perianth segments* 8–20 mm long, 3–6 mm wide, more or less flat, both surfaces sparsely covered with tiny bead-like glands, apex often slightly twisted, acute to shortly acuminate, often shortly apiculate; *dorsal sepal* ovate-lanceolate to lanceolate; *lateral sepals* ovate-lanceolate to lanceolate, often asymmetric; *petals* ovate-lanceolate to lanceolate, often asymmetric; *labellum* ovate-lanceolate to lanceolate, often slightly smaller than other segments. *Column* erect from the end of ovary, 6–9 mm long, 4–6 mm wide, yellow or greenish at base (with or without brownish blotches), cream or whitish towards apex, broadly winged, wings deeply dentate along distal margins, teeth 0.3–2 mm long; *post-anther lobe* with dorsal surface covered by a dense mass of whitish trichomes (each c. 0.5 mm long); *supra-anther lobe* 2–3.5 mm long, 0.7–1 mm wide, 0.7–1.1 mm thick, digitiform, mostly cream or whitish, apex obtuse, emarginate or toothed, ventral side papillose at base; *auxiliary lobes* absent; *lateral lobes* digitiform, 1.5–2 mm long, c. 0.3 mm thick, fleshy, cream or whitish, with 2 similar but slightly thinner basal lobes that are entire or, less often, divided. *Anther* inserted towards base of column, partly obscured behind stigma, ovoid to obloid, 4.5–5.5 mm long, 1.8–2.3 mm wide, connective produced into a fleshy, curved beak 2–3 mm long, c. 1 mm thick, shallowly s-shaped in profile, extending almost to tip of column; *pollinarium* 2–3 mm long; *viscidium* almost round, c. 0.6 mm diam.; *pollinia* white, coherent. *Stigma* situated at base of column, ovate-quadrate, 2–3 mm long, 2–3 mm wide, margins irregular. *Capsules* obovoid, 9–20 mm long, 4–7 mm wide, erect, ribbed. (Fig. 2)

Selected specimens examined: WESTERN AUSTRALIA: Summit of Mt Belches (granite) on Duke of Orleans Bay, c. 42 miles east of Esperance, 30.xi.1950, *J.H. Willis s.n.* (MEL 1550456); Geograph Bay, *Miss Bunbury s.n.* (MEL 1550486); Near King George Sound, 1883, *W. Webb s.n.* (MEL 1550482); Denmark-Mt Barker Rd opposite Blue Lakes Rd junction, 14.xii.1984, *A.P. Brown & S. Van Leeuwen 181* (PERTH 269034); Yanchep Park, 16.xii.1953, *R.D. Royce 4756* (PERTH 268054); From Wancaroo-Mullaloo, 25.xi.1962, *E. Wittmer 84* (PERTH 272906); W side of Angove Road, approximately 400 m from Highway 1, 5.i.1997, *W. Jackson BJ449* (PERTH 4665252); Joondalup Drive, c. 3–4 km N of Ocean Reef Rd, Woodvale, 4.xi.1985, *A.P. Brown 268* (PERTH 907014); Yanchep National Park: On S side of beach and just E of park turnoff, 18.xi.1963, *A.M. James 131* (PERTH 268097); Walpole-Nornalup National Park, 28-mile Road, c. 200 m S of northern boundary of park, 28.i.1993, *J.R. Wheeler 3842 & S.J. Palmik* (PERTH 4343115); El Almain Rd, along Donnelly River, SW of Pemberton, 1.ii.1971, *G.J. Keighery 2022* (PERTH 267643); Cult. ex Toondalup, 28.xi.1991, *D.L. Jones 8593* (CANB 9803983); Darling district: Yalgorup Sawmill site, c. 55 km S of Mandurah on Old Coast Road, 12.xii.1993, *C. French DLJ12738* (CANB 9407994).

Distribution and habitat: Endemic to southwestern Western Australia, from just north of Perth to just east of Albany. Records from Mt Belches and Cape Arid east of Esperance (A. Brown, pers. comm.) represent an extreme disjunction. Grows in cool, moist forests, often around the edges of winter-wet swamps, but also in adjacent drier areas. Altitude: 5–200 m.

Conservation status: Uncommon, but moderately widespread and well conserved.

Flowering period: November to February.

Pollination biology: The large, freely opening flowers and only occasional capsule production would suggest that this species is probably entomophilous.

Notes: *Thelymitra fuscolutea* R.Br. is a late flowering member of the *T. fuscolutea* complex mostly from moist habitats, but also from deep sand and well drained laterite soils. See Table 2 for other distinguishing features.

2. *Thelymitra benthami* Rchb.f., *Beitr. Syst. Pflanzenk.* 55 (1871).

Type: Swan River, *J. Drummond* 825 (lectotype W, *vide* George 1971; isolectotypes G, W, K); *Syntypes:* Swan River, *J. Drummond* 145 (K, W); *?Syntype:* Swan River, 1.x.1838, *J. Drummond s.n.* (BM!).

Illustrations: Reichenbach (1874) plate 19911, figs 6-8; Nicholls (1969) plate 38 (as *T. fuscolutea*); Hoffman & Brown (1984) page 28 (as *T. fuscolutea* var. *fuscolutea*); Bates & Weber (1990) plate 201; Hoffman & Brown (1992) page 242; Backhouse & Jeanes (1995) page 332; Hoffman & Brown (1998) page 242; Jeanes & Backhouse (2004) page 95.

Glabrous terrestrial herb. Tubers ovoid or obovoid, fleshy. Leaf ovate-lanceolate to ovate, 5–25 cm long, 8–55 mm wide, erect or obliquely erect, blade more or less flat, leathery, bright green to yellowish green, sheathing at base, apex subacute to acute, sometimes shortly apiculate. Scape 10–55 cm tall, 1.4–5 mm diam., more or less straight, green. Sterile bracts usually 2, occasionally 3, ovate-lanceolate, 2–10 cm long, 4–20 mm wide, closely sheathing, usually green, apex often free and diverging from scape, acuminate. Fertile bracts ovate-acuminate to obovate-acuminate, 7–35 mm long, 3–9 mm wide, sheathing the pedicels, usually green. Pedicels 0.5–15 mm long, slender. Ovary narrow-obovoid, 3–13 mm long, 2–4 mm wide, often curved. Flowers 1–15, 23–40 mm across, thick-textured, yellow or greenish usually with reddish brown spots and blotches over entire inner surface, opening freely in warm weather. Perianth segments 10–20 mm long, 4–8 mm wide, somewhat concave, both surfaces sparsely covered with tiny bead-like glands, acute to shortly acuminate, often shortly apiculate; dorsal sepal ovate to ovate-lanceolate; lateral sepals ovate to ovate-lanceolate; petals ovate to ovate-lanceolate; labelum ovate-lanceolate, often smaller than other segments. Column erect from the end of ovary, 6–9 mm long, 4–6 mm wide, yellow or greenish with reddish brown spots, broadly winged, wings deeply dentate along distal margins, teeth 0.2–1.7 mm long; post-anther lobe with dorsal surface covered by a dense mass of orange trichomes (each c. 0.5 mm long); supra-anther lobe 1.7–2.5 mm long, rod-like with a somewhat swollen clavate apex 0.7–1.3 mm wide and 0.9–1.6 mm thick, yellow and reddish brown, apex rugose, ventral surface papillose at base; auxiliary lobes absent; lateral lobes digitiform, 1–2 mm long, c. 0.3 mm thick, fleshy, yellow, with 2 similar but slightly thinner and longer basal lobes that are entire or, less often, divided. Anther inserted towards base of column, partly obscured behind stigma, ovoid, 5–6 mm long, 2–2.5 mm wide, connective produced into a fleshy, curved beak 2.5–3.5 mm long, c. 0.8 mm thick, shallowly s-shaped in profile, extending almost to tip of column; pollinarium 2–3 mm long; viscidium almost round, c. 0.6 mm diam.; pollinia white, mealy. Stigma situated at base of column, ovate-quadrangle, 2–3 mm long, 2–3 mm wide, margins irregular. Capsules obovoid, 10–24 mm long, 4–8 mm wide, erect, ribbed. (Fig. 3)

Selected specimens examined: WESTERN AUSTRALIA: Tammin, 28.x.1931, *?Miss Simmonds s.n.* (MEL 573516); Jandakot Swamp, x.1957, *Rex Filson* 42 (MEL 606279); Jarrahdale, x.1929, *B.T. Goadby s.n.* (MEL 1550487); Albany district, 1946, *W.H. Nicholls s.n.* (MEL 1549074); Victoria Desert, 18.ix.1891, *R. Helms s.n.* (MEL 1550489); Manjimup area, x.1946, *W.H. Nicholls s.n.* (MEL 1549067); Bussleton, xi.1946, *W.H. Nicholls s.n.* (MEL 1548972); Albany area, x.1946, *W.H. Nicholls s.n.* (MEL 644475); Disused gravel pit, 4.5 km from Hopetoun on Ravensthorpe Road, 13.x.1998, *M. Bennett* 326 (PERTH 05271541); Reserve 22897, S of

Darlington, 28.x.1977, *A.S. George 14983* (PERTH 272922); King River Road Reserve, 20.xi.1999, *R. Heberle ORG2864* (CANB 631100); East of Cranbourne, property of Frank Smith, xi.1999, *R. Heberle ORG2859 & F. Smith* (CANB 631099). SOUTH AUSTRALIA: Seotts Creek near Mt Lofty, 26.xi.1905, *R.S. Rogers s.n.* (MEL 2016024); Encounter Bay, xi.1894, *Miss Hussey s.n.* (MEL 114396); Port Lincoln, 1875, *J.L. Browne s.n.* (MEL 1551045); Mt Lofty, x.1917, *A.C.F. Gates s.n.* (MEL 221706); Onkaparinga, 20.xi.1895, *F. Mueller s.n.* (MEL 1550491); Kangaroo Island, x.1885, *Horswell s.n.* (MEL 1550490); Mt Lofty, 16.xi.1906, *R.S. Rogers s.n.* (PERTH 300144); Mt Lofty, xi.1906, *R.S. Rogers s.n.* (NSW 462459); Deep Creek Conservation Park to Cape Jervis, x.1991, *R.J. Bates 26202* (AD 99147324); Kangaroo Island: Pandara, 1.xi.1986, *R.J. Bates 7526* (AD RBK1); Eyre Peninsula: Stamford Hill in Port Lincoln, 28.x.1990, *R.J. Bates 24862* (AD 99108271); South East: Big Heath National Park, north-eastern part, 5.xi.1969, *J.Z. Weber 1776* (AD 97014390). VICTORIA: Wilsons Promontory National Park, 8.xi.1983, *A.C. Beauglehole 75252 & J. Eichler* (MEL 1531719); 5 miles NE of Anglesea, 20.xi.1955, *J.H. Willis s.n.* (MEL 1550484); Aireys Inlet, 14.xi.1927, *M. Sutherland s.n.* (MEL 625477); Grampians, Victoria Range, near junction of Hamilton waterworks road & Brown's Creek track, 22.xi.1964, *A.H. Corrick s.n.* (MEL 665161); Wannon Valley, ?*L. Banfield s.n.* (MEL 236700); Woolwash Road, Mt Clay, 21.xi.1983, *C. & D. Woolcock 1503* (MEL 660342); Portland, 19.xi.1934, *F. Mellblom s.n.* (MEL 650427); Wilsons Promontory, xi.1931, *E. Devonshire s.n.* (MEL 625272); Ararat, 10.xi.1932, *W.L. Williams s.n.* (AD 97721170). TASMANIA: Centre Hill, Melrose Road, Flinders Island, 30.x.2000, *H. Wapstra s.n.* (HO 516737, HO 516738 & MEL 2198341).

Distribution and habitat: Western Australia, South Australia, Victoria and Tasmania (Flinders Island). Grows mainly in heathlands, open forests and heathy woodlands mostly on well-drained sand and clay loams. Flowering is strongly fire-stimulated in the eastern States. Altitude: 0–300 m.

Conservation status: Common in Western Australia, but generally uncommon in the eastern States. Widespread and well conserved.

Flowering period: September to November.

Pollination biology: The readiness with which this species produces seed capsules would indicate that it is most likely facultatively autogamous.

Notes: *Thelymitra benthamiana* is a generally early flowering member of the *T. fuscolutea* complex from a variety of dry and moist habitats of southern Australia. See Table 2 for other distinguishing features. It is the only species in the group to occur in eastern Australia. Plants display considerable variation across the range, particularly in terms of flower colour and the shape of the supra-anther lobe of the column.

3. *Thelymitra jacksonii* Hopper & A.P.Br. ex Jeanes *sp. nov.*

T. stellatae Lindl. affinis sed distributione plus meridionali, florescentia serotiniore, floribus fuscatiore, lobo supra-antheram columnae apice clavato crassiore differt.

Type: Western Australia. Beside South West Highway near Broke Inlet Rd, 15.xii.1996, *W. Jackson BJ381* (holotype PERTH 5503388, isotypes PERTH 5503396 & CANB).

Illustrations: Hoffman & Brown (1992) p. 245; Hoffman & Brown (1998) p. 245

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* ovate-lanceolate to ovate, 6–12 cm long, 9–20 mm wide, erect or obliquely erect, blade more or less flat, leathery, bright green to yellowish green, sheathing at base, apex subacute to acute, sometimes shortly apiculate. *Scape* 19–35 cm tall, 1.4–2 mm diam., more or less straight, green. *Sterile bracts* usually 2, occasionally 3, ovate-lanceolate, 2–7 cm long, 4–8 mm wide, closely sheathing, usually green, apex often free and diverging from scape, acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 10–25 mm long, 4–7 mm wide, sheathing

the pedicels, green or purplish. *Pedicels* 4–12 mm long, slender. *Ovary* narrow-obovoid, 10–15 mm long, 3–4 mm wide, often curved. *Flowers* 2–5, 44–56 mm across, thick-textured, dark golden-brown with large yellow blotches and striations, sweetly scented, opening freely in warm weather. *Perianth segments* 16–27 mm long, 4–8 mm wide, more or less flat, both surfaces sparsely covered with tiny bead-like glands, apex often slightly twisted, acute to shortly acuminate, often shortly apiculate; *dorsal sepal* ovate-lanceolate to lanceolate; *lateral sepals* ovate-lanceolate to lanceolate; *labellum* lanceolate, slightly asymmetric; *petals* ovate-lanceolate to lanceolate, slightly asymmetric; *labellum* lanceolate, smaller than other segments. *Column* erect from the end of ovary, 9–12 mm long, 5–7 mm wide, golden brown at base, orange towards apex, broadly winged, wings deeply dentate along distal margins, teeth 0.1–2.5 mm long; *post-anther lobe* with dorsal surface covered by a dense mass of orange trichomes (each c. 0.4 mm long), *supra-anther lobe* 3–4 mm long, rod-like with a swollen clavate apex 2–2.5 mm wide and 2–3 mm thick, orange, apex often bilobed, ridged, rugose to warty, ventral surface papillose towards base; *auxiliary lobes* absent; *lateral lobes* digitiform, 2–2.6 mm long, c. 0.3 mm thick, fleshy, orange, with 2 similar but slightly thinner basal lobes that are entire or, less often, divided. *Anther* inserted towards base of column, partly obscured behind stigma, ovoid, 5.5–6.5 mm long, 2–2.5 mm wide, connective produced into a fleshy, curved beak 3–4 mm long, c. 1.5 mm thick, shallowly s-shaped in profile, extending almost to tip of column; *pollinarium* 2–3 mm long; *viscidium* almost round, c. 0.6 mm diam.; *pollinia* white, coherent. *Stigma* situated at base of column, ovate-quadrangle, 3–3.5 mm long, 3–3.5 mm wide, margins irregular. *Capsules* obovoid, 10–20 mm long, 4–8 mm wide, erect, ribbed. (Fig. 4)

Specimens examined: WESTERN AUSTRALIA: Beardmore Road, 24 km NW of Walpole, 22.xii.1994, W. Jackson BJ310 (PERTH 4279689); Aircraft Road, E side, at junction with Preston Road, 15.xii.1995, W. Jackson BJ379 (PERTH 4449894); c. 1 km NW of Beardmore Road, along South West Highway, 27.xii.1995, W. Jackson BJ377 (PERTH 4449754); Darling district c. 26 km NW of Walpole, 14.xii.1993, B. Jackson DLJ12753 (CANB 9603659); Walpole area, 18.xii.2000, W. Jackson JAJ983 (MEL 2143918).

Distribution and habitat: Endemic to southwestern Western Australia, in the vicinity of Walpole. Grows around the edges of winter-wet depressions in sandy-clay soil. Altitude: c. 80 m.

Conservation status: Confined to a limited range with few known populations. Suggest 2EC by criteria of Briggs & Leigh (1996), and Endangered (E) by criteria of IUCN (2000).

Flowering period: December and January.

Pollination biology: The large, freely opening flowers and sporadic capsule production would suggest that the species is probably entomophilous.

Notes: *Thelymitra jacksonii* is a late flowering member of the *T. fuscolutea* complex from generally moist habitats. See Table 2 for other distinguishing features.

Etymology: After the late William (Bill) Jackson (1929–2002), local field naturalist who discovered the species. Bill was of great assistance during my field work in Western Australia, and also supplied me with specimens of various species of *Thelymitra* for my research.

4. *Thelymitra magnifica* Jeanes, sp. nov.

T. stellatae Lindl. affinis sed florescentia praecociore, floribus leviter majoribus, lobo supra-antheram columnae apice clavato tumidiore differt.

Type: Western Australia. Crystal Brook, 15.x.2000, J.A. Jeanes 841 (holotype MEL 2087468, isotypes MEL 2087469 & PERTH).

Illustration: Hoffman & Brown (1998) page 454 (as *Thelymitra* aff. *stellata*).

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* ovate-lanceolate to ovate, 6–15 cm long, 10–25 mm wide, erect or obliquely erect, blade more or less flat, leathery, bright green to yellowish green, sheathing at base, apex subacute to acute, sometimes shortly apiculate. *Scape* 20–35 cm tall, 1.5–2.5 mm diam., more or less straight, usually green. *Sterile bracts* usually 2, lanceolate to ovate-lanceolate, 2–8 cm long, 4–8 mm wide, closely sheathing at base, usually green, apex often free and diverging from scape, acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 10–35 mm long, 4–7 mm wide, sheathing the pedicels, usually green. *Pedicels* 4–10 mm long, slender. *Ovary* narrow-obovoid, 10–15 mm long, 3–4 mm wide, often curved. *Flowers* 2–7, 44–56 mm across, thick-textured, dark golden-brown with large yellow blotches and stripes, cinnamon scented, opening freely in warm weather. *Perianth segments* 16–28 mm long, 4–8 mm wide, more or less flat, both surfaces sparsely covered with tiny bead-like glands, apex often slightly twisted, acute to shortly acuminate, often shortly apiculate; *dorsal sepal* ovate-lanceolate to lanceolate; *lateral sepals* ovate-lanceolate to lanceolate, asymmetric; *petals* ovate-lanceolate to lanceolate, slightly asymmetric; *labellum* lanceolate, smaller than other segments. *Column* erect from the end of ovary, 7–9 mm long, 5–6 mm wide, golden brown at base, yellow towards apex, broadly winged, wings deeply dentate along distal margins, teeth 0.3–2.5 mm long; *post-anther lobe* with dorsal surface covered by a dense mass of orange trichomes (each c. 0.4 mm long); *supra-anther lobe* 2.5–3.5 mm long, rod-like with a swollen clavate apex 1.2–1.5 mm wide and 1.5–2.5 mm thick, orange, apex rugose to warty, ventral surface papillose towards base; *auxiliary lobes* absent; *lateral lobes* digitiform, 2–2.5 mm long, c. 0.3 mm thick, fleshy, orange, with 2 similar but slightly thinner basal lobes that are entire or, less often, divided. *Antler* inserted towards base of column, partly obscured behind stigma, ovoid, 5.5–6 mm long, 2.5–3 mm wide, connective produced into a fleshy, curved beak 2.5–3 mm long, c. 1.4 mm wide, shallowly s-shaped in profile, extending almost to tip of column; *pollinarium* 2.5–3.5 mm long; *viscidium* almost round, c. 0.6 mm diam.; *pollinia* coherent, white. *Stigma* situated at base of column, ovate-quadrate, 3–4 mm long, 2.8–3.5 mm wide, margins irregular. *Capsules* not seen. (Fig. 5)

Specimens examined: WESTERN AUSTRALIA: Near Kalanumba [Kalamunda], stony ridges, x.1931, B.T. Goadby s.n. (PERTH 272450); Maida Vale, x.1932, B.T. Goadby s.n. (PERTH 306045); Armadale, T.M. Burgess s.n. (PERTH 272361).

Distribution and habitat: Endemic to southwestern Western Australia, on the western escarpment of the Darling Ranges between Gooseberry Hill and Armadale. Grows on slopes in seasonally moist sandy clay and granite soils in the vicinity of *Eucalyptus wandoo* trees amongst low shrubs. Altitude: 100–250 m.

Conservation status: Extremely rare and known from a very limited geographic range. Suggest 2E by criteria of Briggs & Leigh (1996), and Endangered (E) by criteria of IUCN (2000).

Flowering period: September and October.

Pollination biology: The large, freely opening flowers and spasmodic capsule production would suggest that the species is probably entomophilous.

Notes: *Thelymitra magnifica* is an early flowering member of the *T. fuscointea* complex from seasonally moist granitic slopes in the Darling Ranges. See Table 2 for other distinguishing features.

Etymology: Latin *magnifica*; noble, eminent, stately; this is a very striking and beautiful species.

5. *Thelymitra dedmaniarum* R.S.Rogers, *Trans. & Proc. Roy. Soc. South Australia* 62: 13 (1938)—as *Thelymitra Dedmaniae*.

Type: Western Australia, Toodyay, 11.xi.1934, *Mrs & Miss Dedman s.n.* (lectotype AD 97722521/1!, *hic designatus*; isolectotype AD 97722521/2!).

Illustrations: Hoffman & Brown (1992) page 243 (as *T. dedmaniae*); Hoffman & Brown (1998) page 243 (as *T. aff. dedmaniarum*); Phillipmore *et al* (1999) front cover (as *T. manginii*).

Glabrous terrestrial *herb*. *Tubers* not seen. *Leaf* ovate-lanceolate to ovate, 5–25 cm long, 10–35 mm wide, erect or obliquely erect, blade flat, leathery, bright green to yellowish green, sheathing at base, apex subacute to acute, sometimes shortly apiculate. *Scape* 25–55 cm tall, 2–3.5 mm diam., slender to stout, straight, green. *Sterile bracts* usually 2, occasionally 3, lanceolate, 2.5–9 cm long, 4–10 mm wide, closely sheathing at base, usually green, apex often free and diverging from scape, acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 7–35 mm long, 3–9 mm wide, sheathing the pedicels, usually green. *Pedicels* 1–15 mm long, slender. *Ovary* narrow-obovoid, 6–12 mm long, 1.5–4 mm wide, curved. *Flowers* 2–12, 28–55 mm across, thick-textured, golden yellow, often reddish brown towards the centre, cinnamon scented, opening freely in warm weather. *Perianth segments* 12–28 mm long, 3–10 mm wide, more or less flat, both surfaces sparsely covered with tiny bead-like glands, apex often slightly twisted, acute to shortly acuminate, often shortly apiculate; *dorsal sepal* ovate-lanceolate to lanceolate; *lateral sepals* ovate-lanceolate to lanceolate, asymmetric; *petals* ovate-lanceolate to lanceolate, asymmetric; *labellum* lanceolate, often somewhat smaller than other segments. *Column* erect from the end of ovary, 6–9 mm long, 5–8 mm wide, yellow, broadly winged, wings deeply dentate along distal margins, teeth 0.1–2 mm long; *post-anther lobe* with dorsal surface covered by a dense mass of orange trichomes (each c. 0.4 mm long); *supra-anther lobe* 2–3 mm long, yellow, rod-like with a swollen clavate notched apex 1–2.2 mm wide, 1.5–3 mm thick, apex rugose, ventral surface papillose at base; *auxiliary lobes* absent; *lateral lobes* digitiform, 1–2.5 mm long, c. 0.4 mm thick, fleshy, yellow, with 2 similar but slightly thinner basal lobes that are entire or, less often, divided. *Anther* inserted towards base of column, partly obscured behind stigma, ovoid, 5–7 mm long, 2–3.5 mm wide, connective produced into a fleshy, curved beak 2.5–3.5 mm long, c. 2 mm thick, shallowly s-shaped in profile, extending to tip of column; *pollinarium* 2–4 mm long; *viscidium* almost round, c. 0.6 mm diam.; *pollinia* coherent, white. *Stigma* situated at base of column, ovate-quadrate, 3–4 mm long, 3–4.5 mm wide, margins irregular. *Capsules* not seen. (Fig. 6)

Specimens examined: WESTERN AUSTRALIA: Shire Recreation Reserve No 26865, Gidgegannup, 13.xi.1992, *J.L. Robson s.n.* (PERTH 4221435); Near Gidgegannup, 18.xi.1962, *E.W. Witmer* 82 (PERTH 272388); Wooroloo, xi.1907, *M. Koch s.n.* (NSW 181304 & NSW 462472); Susannah Ck, Red Hill, 27.x.1963, *F. Humphreys s.n.* (PERTH 271993).

Distribution and habitat: Endemic to southwestern Western Australia where known only from the Red Hill to Wooroloo area east of Perth. Grows in *E. wandoo* and *Encalyptus accedens* woodlands on red/brown sandy loam soil associated with dolerite and granite outcrops. Altitude: 100–250 m.

Conservation status: Extremely localised, critically endangered and declared as Rare Flora in Western Australia. Suggest 2E by criteria of Briggs & Leigh (1996), and Critically Endangered (CR) by criteria of IUCN (2000).

Flowering period: Late October and November.

Pollination biology: The large, freely opening flowers and spasmodic capsule production would suggest that the species is probably entomophilous.

Notes: *Thelymitra dedmaniarum* is a mid- to late-flowering member of the *T. fuscolutea* complex from dry habitats. See Table 2 for other distinguishing features.

The common name 'Cinnamon Sun Orchid' has been applied to this species.

6. *Thelymitra yorkensis* Jeanes *sp. nov.*

T. stellatae Lindl. affinis sed ad sylvis Eucalypti wandoo magnopere limitato, florescentia leviter scrotiniore, floribus paucioribus magis late dispositis cinnameis differt.

Type: Population 7. Kent Road, SW of York, 20.xi.1996, K. Kershaw & F. Hort *s.n.* (holotype PERTH 4858301).

Thelymitra dedmaniarum sensu Hoffman & Brown (1998), *non* R.S.Rogers.

Illustrations: Hort (1997) front cover, p.7 (both as *T. dedmaniarum*) & p. 11 (as *T. ?stellata*); Hoffman & Brown (1998) page 451 (as *T. dedmaniarum*).

Glabrous terrestrial *herb*. *Tubers* ovoid or obovoid, 1–4 cm long, 5–15 mm wide, fleshy. *Leaf* ovate-lanceolate to ovate, 5–20 cm long, 9–30 mm wide, erect or obliquely erect, blade more or less flat, leathery, bright green to yellowish green, sheathing at base, apex subacute to acute, sometimes shortly apiculate. *Scape* 14–45 cm tall, 1.2–3 mm diam., more or less straight, green. *Sterile bracts* usually 2, occasionally 3, ovate-lanceolate, 2.5–8.5 cm long, 4–10 mm wide, closely sheathing, usually green, apex often free and diverging from scape, acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 9–31 mm long, 4–9 mm wide, sheathing pedicels, green or purplish. *Pedicels* 1–13 mm long, slender. *Ovary* narrow-obovoid, 6–11 mm long, 2–4 mm wide, often curved. *Flowers* 2–8, 38–54 mm across, thick-textured, orange with reddish brown edges, cinnamon scented, opening freely in warm weather. *Perianth segments* 13–26 mm long, 3.5–8 mm wide, more or less flat, both surfaces sparsely covered with tiny bead-like glands, apex often slightly twisted, acute to shortly acuminate, often shortly apiculate; *dorsal sepal* ovate-lanceolate to lanceolate; *lateral sepals* ovate-lanceolate to lanceolate, slightly asymmetric; *petals* ovate-lanceolate to lanceolate, slightly asymmetric; *labellum* lanceolate, often smaller than other segments. *Column* erect from the end of ovary, 6–8 mm long, 4.5–7 mm wide, yellowish at base, orange towards apex, broadly winged, wings deeply dentate along distal margins, teeth 0.2–2 mm long; *post-anther lobe* with dorsal surface covered by a dense mass of orange trichomes (each c. 0.4 mm long); *supra-anther lobe* 2–3 mm long, rod-like with a swollen clavate apex 0.8–1.3 mm wide, 1.2–1.7 mm thick, orange, apex rugose to warty, ventral surface papillose at base; *auxiliary lobes* absent; *lateral lobes* digitiform, 1–2.7 mm long, c. 0.3 mm thick, fleshy, orange, with 2 similar but slightly thinner basal lobes that are entire or, less often, divided. *Anther* inserted towards base of column, partly obscured behind stigma, ovoid, 4.5–5.7 mm long, 2–2.5 mm wide, shallowly s-shaped in profile, connective produced into a fleshy, curved beak 2.5–3 mm long, c. 1.5 mm thick, extending almost to tip of column; *pollinarium* 2–3 mm long; *viscidium* almost round, c. 0.6 mm diam.; *pollinia* white, coherent. *Stigma* situated at base of

column, ovate-quadrate, 2.2–3.5 mm long, 2.4–4 mm wide, margins irregular. *Capsules* obovoid, 10–20 mm long, 4–8 mm wide, erect, ribbed. (Fig. 7)

Selected specimens examined: WESTERN AUSTRALIA: Dodaderry Nature Reserve number 37306, 8.xi.1991, J.L. Robson s.n. (PERTH 1661981); Population 12. Kent Road, SW of York, 20.xi.1996, K. Kershaw & F. Hort s.n. (PERTH 4858247); Population 10. Kent Road, SW of York, 20.xi.1996, K. Kershaw & F. Hort s.n. (PERTH 4858239); Population 6. Kent Road, SW of York, 20.xi.1996, K. Kershaw & F. Hort s.n. (PERTH 4858336); Population 9. Nuytsia Road, SW of York, 20.xi.1996, K. Kershaw & F. Hort s.n. (PERTH 4858263); Population 5. Kent Road, SW of York, 20.xi.1996, K. Kershaw & F. Hort s.n. (PERTH 4858344); Population 8. Nuytsia Road, SW of York, 20.xi.1996, K. Kershaw & F. Hort s.n. (PERTH 4858271); Darling district, Kent Road, Talbot, 7.xi.1996, F. Hort & J. Hort ORG410 (CANB 611708); Qualen Road, SW of York, 4.xi.2000, C.J. French 2796 (MEL 2143919).

Distribution and habitat: Endemic to southwestern Western Australia, in a small area south-west of York. Grows in open *E. wandoo* and *E. accedens* woodland on granitic or laterite ridges and slopes. Altitude: 250–400 m.

Conservation status: Confined to a limited range with about 12 known populations. Suggest 2EC by criteria of Briggs & Leigh (1996), and Endangered (E) by criteria of IUCN (2000).

Flowering period: Late October to early December.

Pollination biology: The large, freely opening flowers and sporadic capsule production would suggest that the species is probably entomophilous.

Notes: *Thelymitra yorkensis* has been confused with *T. dedmaniarum*, but the two species are distinct. The former usually has strongly bicolorous flowers, while in the latter the flowers are fairly uniformly golden yellow. See Table 2 for other distinguishing features.

The common name ‘Bronze Orchid’ has been applied to this species.

Etymology: From the town of York, Western Australia, near which all the currently known populations have been located.

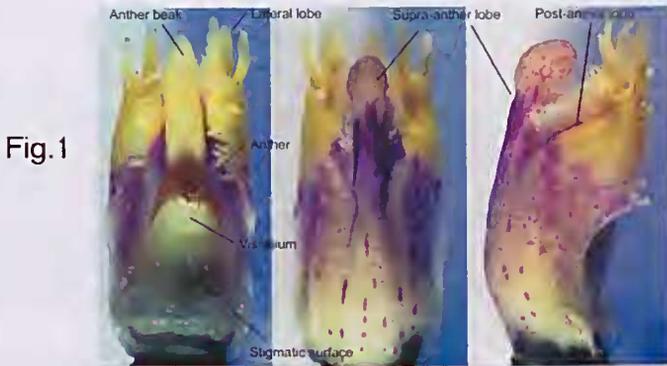
7. *Thelymitra stellata* Lindl., *Edwards’s Bot. Reg.* appendix to vols. 1–23 [*Sketch Veg. Swan R.*]: 49 (1839-1840).

Type: ‘Swan River’, 1839, J. Drummond s.n. (holotype K-L!, isotypes BM!, FI!, K, AD!).

Thelymitra fuscolutea R.Br. var. *stellata* (Lindl.) A.S.George, *Nuytsia* 1(2): 194 (1971).

Illustrations: Hoffman & Brown (1984) page 30 (as *T. fuscolutea* var. *stellata*); Jones (1988) page 304; Hoffman & Brown (1992) page 244; Hoffman & Brown (1998) page 244.

Glabrous terrestrial *herb*. *Tubers* ovoid or obovoid, 1–3 cm long, 5–15 mm wide, fleshy. *Leaf* ovate-lanceolate to ovate, 5–20 cm long, 10–35 mm wide, erect or obliquely erect, blade more or less flat, leathery, bright green to yellowish green, sheathing at base, apex subacute to acute, sometimes shortly apiculate. *Scape* 15–45 cm tall, 1.4–3.5 mm diam., more or less straight, green. *Sterile bracts* usually 2, occasionally 3, ovate-lanceolate, 2–7 cm long, 3–10 mm wide, closely sheathing, usually green, apex often free and diverging from scape, acuminate. *Fertile bracts* ovate-acuminate to obovate-acuminate, 7–35 mm long, 3–7 mm wide, sheathing the



Figures 1-4. Fig.1. Column features of *Thelymitra benthamiana*. From left to right: ventral, dorsal and lateral views (photographs by Jeff Jeanes). Fig. 2. *Thelymitra fuscolutea* (photograph by Andrew Brown, Western Australia). Fig. 3. *Thelymitra benthamiana* (photograph by Jeff Jeanes). Fig. 4. *Thelymitra jacksonii* (photograph by Andrew Brown, Department of Environment and Conservation, Western Australia).



Figures 5-8. **Fig. 5.** *Thelymitra magnificent* (photograph by Jeff Jeanes). **Fig. 6.** *Thelymitra dedmaniarum* (photograph by Andrew Brown, Department of Environment and Conservation, Western Australia). **Fig. 7.** *Thelymitra yorkensis* (photograph by Andrew Brown, Department of Environment and Conservation, Western Australia). **Fig. 8.** *Thelymitra stellata* (photograph by Andrew Brown, Department of Environment and Conservation, Western Australia).

pedicels, green or purplish. *Pedicels* 5–12 mm long, slender. *Ovary* narrow-obovoid, 6–13 mm long, 1.5–3.5 mm wide, often curved. *Flowers* 2–12, 28–45 mm across, thick-textured, brown to reddish brown with large yellow blotches and stripes on inner surface, sweetly scented, opening freely in warm weather. *Perianth segments* 12–22 mm long, 3–7 mm wide, more or less flat, both surfaces sparsely covered with tiny bead-like glands, apex often slightly twisted, acute to shortly acuminate, often shortly apiculate; *dorsal sepal* ovate-lanceolate to lanceolate; *lateral sepals* ovate-lanceolate to lanceolate, slightly asymmetric; *petals* ovate-lanceolate to lanceolate, slightly asymmetric; *labellum* lanceolate, often smaller than other segments. *Column* erect from the end of ovary, 5.5–8 mm long, 3–5 mm wide, orange-brown at base, orange towards apex, broadly winged, wings deeply dentate along distal margins, teeth 0.3–2 mm long; *post-anther lobe* with dorsal surface covered by a dense mass of orange trichomes (each c. 0.3 mm long); *supra-anther lobe* 2–3 mm long, rod-like with a swollen clavate notched apex 0.7–1.2 mm wide and 1.1–1.5 mm thick, orange, apex rugose to warty, ventral surface papillose at base; *auxiliary lobes* absent; *lateral lobes* digitiform, 1.5–2 mm long, c. 0.3 mm thick, fleshy, orange, with 2 similar but slightly thinner basal lobes that are entire or, less often, divided. *Anther* inserted towards base of column, partly obscured behind stigma, ovoid, 4.5–5.5 mm long, 1.8–2.3 mm wide, connective produced into a fleshy, curved beak 2–3 mm long, c. 1.2 mm thick, shallowly s-shaped in profile, extending almost to tip of column; *pollinarium* 2–3 mm long; *viscidium* almost round, c. 0.6 mm diam.; *pollinia* coherent, white. *Stigma* situated at base of column, ovate-quadrate, 2.5–3.5 mm long, 2–3 mm wide, margins irregular. *Capsules* obovoid, 10–20 mm long, 4–8 mm wide, erect, ribbed. (Fig. 8)

Specimens examined: WESTERN AUSTRALIA: Southern foot of Mt Lesueur, Hill River district, 7.x.1961, *J.H. Willis s.n.* (MEL 221757 & PERTH 272418); East of Greenhead on road leading out to Brand Highway, 21.x.1996, *B.A. Fuhrer 96/65* (MEL 2038912); Darling Range, *B.T. Goadby s.n.* (PERTH 272442); Hill ENE of Mt Peron, NE of Jurien, 24.x.1979, *E.A. Griffin 2442* (PERTH 272868); S of Jurien Rd, W of Brand Highway, 14.x.1979, *E.A. Griffin 2411* (PERTH 272426); Forestfield, 17.x.1978, *R.J. Cranfield 900* (PERTH 306037); Mundaring, *S.A. White s.n.* (AD 97732392); Belevue, 31.x.1930, *W. Dednan s.n.* (AD 97721168); Stirling District: Lake Grace (cultivated), 22.xi.1978, *M.A. Clements s.n.* (CANB 7905118); Arthur River, *J. Smith s.n.* (PERTH 4620178); Swan River, 1843, *J. Drummond 825* (P 220064); Darling District: N of Armidale, 22.xi.1998, *R. Heberle ORG1872* (CANB 611739).

Distribution and habitat: Endemic to southwestern Western Australia, mostly between Three Springs and Pinjarra; and with isolated records from near Arthur River, Corrigin and Dumbleyung (A. Brown, pers. comm.). Grows amongst low shrubs in Jarrah forest or in low heath on rocky lateritic hill tops. Substrates are lateritic loams or gravelly or sandy soils. Altitude: 20–200 m.

Conservation status: Known from a small number of plants at very few sites and Declared as Rarc Flora in Western Australia. Suggest 3EC by criteria of Briggs & Leigh (1996), and Endangered (E) by criteria of IUCN (2000).

Flowering period: October and November

Pollination biology: The large, freely opening flowers and sporadic capsule production would suggest that the species is probably entomophilous.

Notes: *Thelymitra stellata* is a generally mid flowering member of the *T. fuscolutea* complex from dry habitats. See Table 2 for other distinguishing features.

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